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FLOOD INSURANCE STUDY

ORIGINAL

TOWN OF HIGHLANDS, NEW YORK
ORANGE COUNTY

MAY 18, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 361251

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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Flood Insurance Rate Map

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FLOOD INSURANCE STUDY
TOWN OF HIGHLANDS, ORANGE COUNTY, NEW YORK

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Highlands, Orange County, New York, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study was prepared by compiling pertinent information for the flood hazard areas in the Town of Highlands from existing technical and/or scientific data originally prepared by others for purposes other than the preparation of this Flood Insurance Study. This existing data was reviewed by the Federal Emergency Management Agency (FEMA) prior to its use in the development of this Flood Insurance Study to ensure compliance with National Flood Insurance Program (NFIP) accuracy requirements.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This study represents a revision of the original study performed for FEMA. The hydrologic analyses for this study were performed by Tor, Shapiro, and Associates and Dewberry & Davis for FEMA during the preparation of the Flood Insurance Study for the Town of Cornwall, by Camp, Dresser & McKee during the preparation of the Flood Insurance Study for the Town of New Windsor, and by Goodkind & O'Dea during the

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preparation of the Flood Insurance Study for Stony Point. The Cornwall, New Windsor, and Stony Point studies were completed in January 1981, March 1977, and March 1981, respectively.

1.3 Coordination

On June 19, 1986, the results of the study were reviewed at a final Consultation and Coordination Officer's (CCO) meeting attended by representatives of FEMA and the Town of Highlands.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Highlands, Orange County, New York. The Village of Highland Falls is not included in this study. The area of study is shown on the Vicinity Map (Figure 1).

The Hudson River was studied by detailed methods for its entire length affecting the community. This included the addition of base flood elevations and flood boundaries into the original study. The areas studied by detailed methods were selected based upon the extent and validity of available existing hydrologic and hydraulic data.

Popolopen Lake, Mine Lake, Stillwell Lake, and Popolopen Brook were studied by approximate methods. Approximate methods of analysis were used to study all remaining areas having a potential flood hazard that did not have available scientific or technical data.

2.2 Community Description

The Town of Highlands is located in the southeastern portion of Orange County in southeastern New York. It is bordered by the Town of Cornwall to the north, the Town of Philipstown to the east, the Town of Stony Point to the south, and the Town of Woodbury to the west. Highlands is situated on the west bank of the Hudson River.

2.3 Principal Flood Problems

The principal flooding source in the Town of Highlands is the Hudson River.

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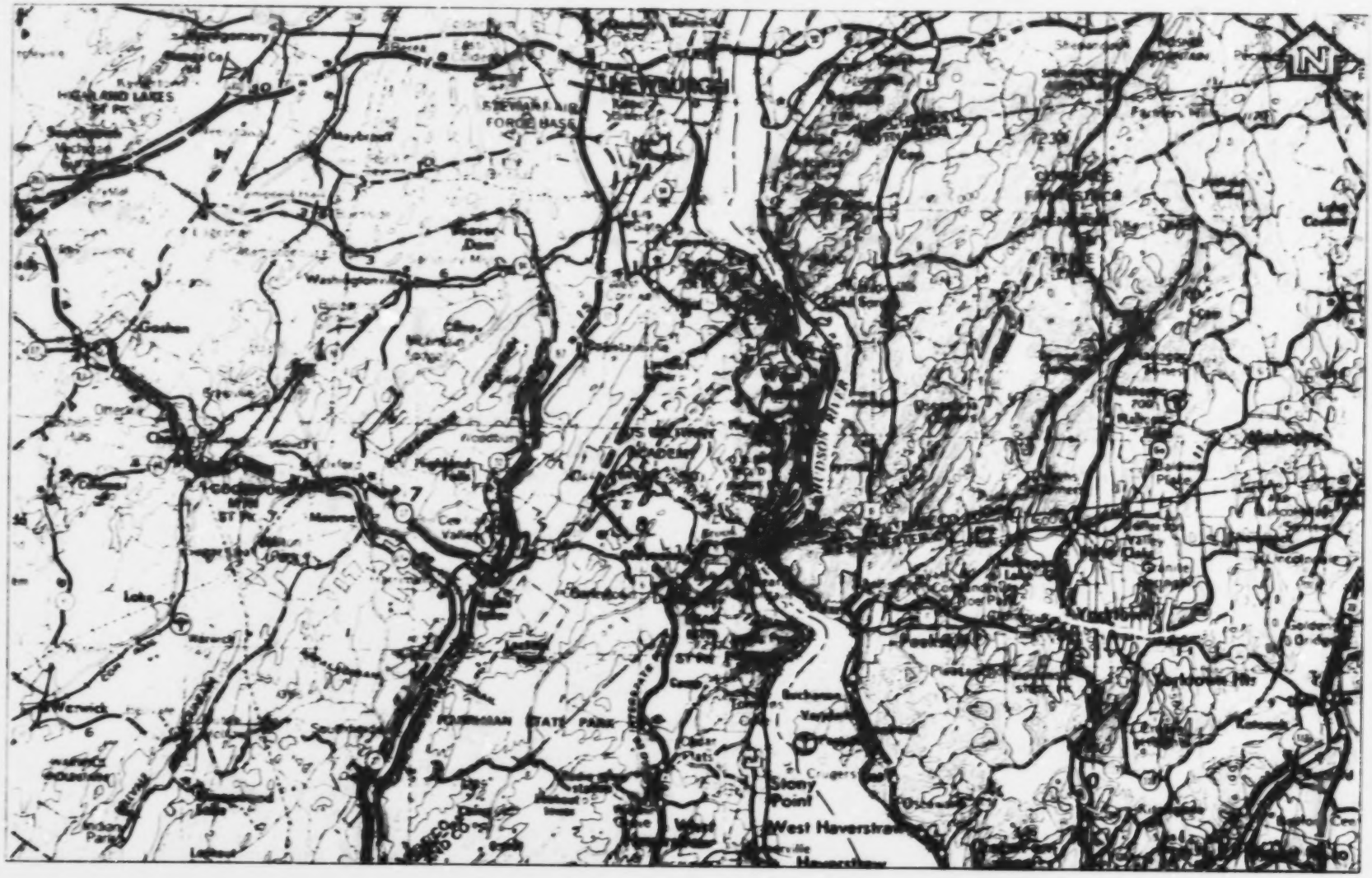

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF HIGHLANDS, NY

(ORANGE CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

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3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Analyses were carried out to establish the peak elevation-frequency relationships for each flooding source studied in detail affecting the community.

The elevation-frequency relationships for the Hudson River were obtained from the Flood Insurance Studies for the Towns of Cornwall and New Windsor (References 1 and 2). In those studies, a tidal stage-frequency analysis developed by the U. S. Army Corps of Engineers was performed for selected recurrence intervals determined from tidal frequency curves (Reference 3). The elevations on the Hudson River through the community were compared to the Flood Insurance Studies for the Towns of Cornwall and Stony Point and found to be in agreement (References 1 and 4).

A summary of peak elevation-frequency relationships for the Hudson River is shown in Table 1, "Summary of Stillwater Elevations."

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD).

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TABLE 1 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
HUDSON RIVER				
Entire shoreline affecting community	6.3	7.0	8.0	9.5

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year flood plain boundaries and 100-year floodway to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the flooding source studied in detail, the 100- and 500-year flood plain boundaries have been delineated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 5).

For the flooding sources studied by approximate methods, the boundary of the 100-year flood was delineated using the original study for Highlands and U. S. Geological Survey flood-prone area maps (References 6 and 7).

The 100- and 500-year flood plain boundaries are shown on the Flood Insurance Rate Map (Exhibit 1). On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

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4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

Floodways are not applicable to areas of tidal flooding; therefore, no floodway was delineated for the Hudson River in this study.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown in this area.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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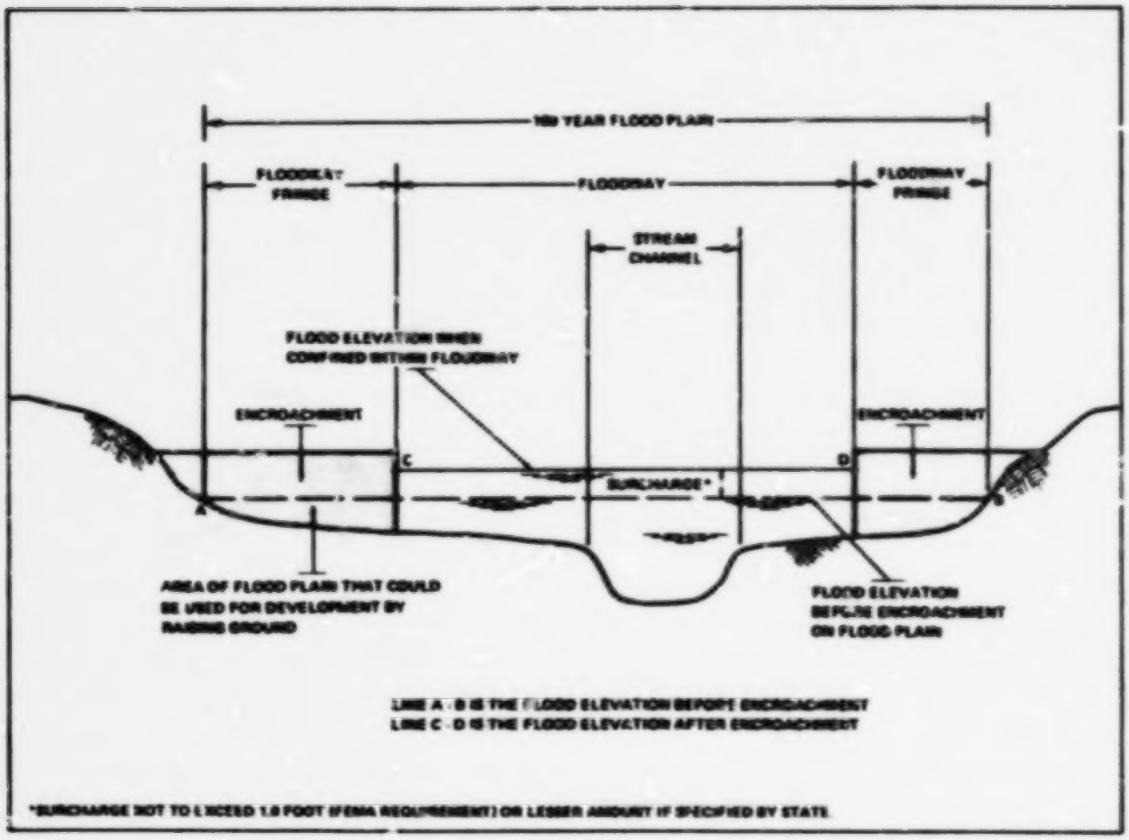
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

Floodway Schematic Figure 2

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

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Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year flood plain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal flood plains that have additional hazards associated with storm waves. Zone V areas are determined by approximate methods, and base flood elevations are not shown.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal flood plains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, and to areas of 100-year shallow flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

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For flood plain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year flood plains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by other organizations originally for purposes other than the preparation of this Flood Insurance Study. The data was identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the NFIP. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, Federal Emergency Management Agency (Regional Director, Region II Office, 26 Federal Plaza, Room 19-100, New York, New York 10278) for consideration for revision of this study.

Flood Insurance Studies for the Towns of Cornwall, New Windsor, and Stony Point have been completed (References 1, 2, and 4). The results of this study are in exact agreement with the results of those studies.

The Flood Insurance Study for the Village of Highland Falls is currently being prepared (Reference 8). The results of that study will be in exact agreement with the results of this study.

A Flood Insurance Rate Map has been published for the Town of Highlands (Reference 6). The differences between the Flood Insurance Rate Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Regional Director, Region II Office, 26 Federal Plaza, Room 1347, New York, New York 10278.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Flood Insurance Study, Town of Cornwall, Orange County, New York, Washington, D. C., September 30, 1982.

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2. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of New Windsor, Orange County, New York, Washington, D. C., December 15, 1978.

3. U. S. Army Corps of Engineers, New York District, Hudson River Tide-Frequency Curves for Albany, Spuyten Duyvill and Catskill, New York, New York.

4. Federal Emergency Management Agency, Flood Insurance Study, Town of Stony Point, Rockland County, New York, Washington, D. C., September 30, 1981.

5. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Peekskill, New York, 1957; Popolopen Lake, New York, 1957; Cornwall, New York, 1957; West Point, New York, 1957.

6. Federal Emergency Management Agency, Flood Insurance Study, Town of Highlands, Orange County, New York, Washington, D. C., November 30, 1979.

7. U. S. Department of the Interior, Geological Survey, Maps of Flood-Prone Areas, Scale 1:24,000, Contour Interval 20 Feet: Peekskill, New York, 1957; Popolopen Lake, New York, 1957.

8. Federal Emergency Management Agency, Flood Insurance Study, Village of Highland Falls, Orange County, New York (Unpublished).

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